

You Are In a Volcano!

Summer 2001

In Yellowstone, you are standing in one of the world's largest active volcanoes. While most of the world's volcanoes are found in areas near the tectonic plate boundaries, the Yellowstone volcano is the result of heat and molten rock rising as a hotspot.

50–40 million years ago
—Absaroka Volcanics—

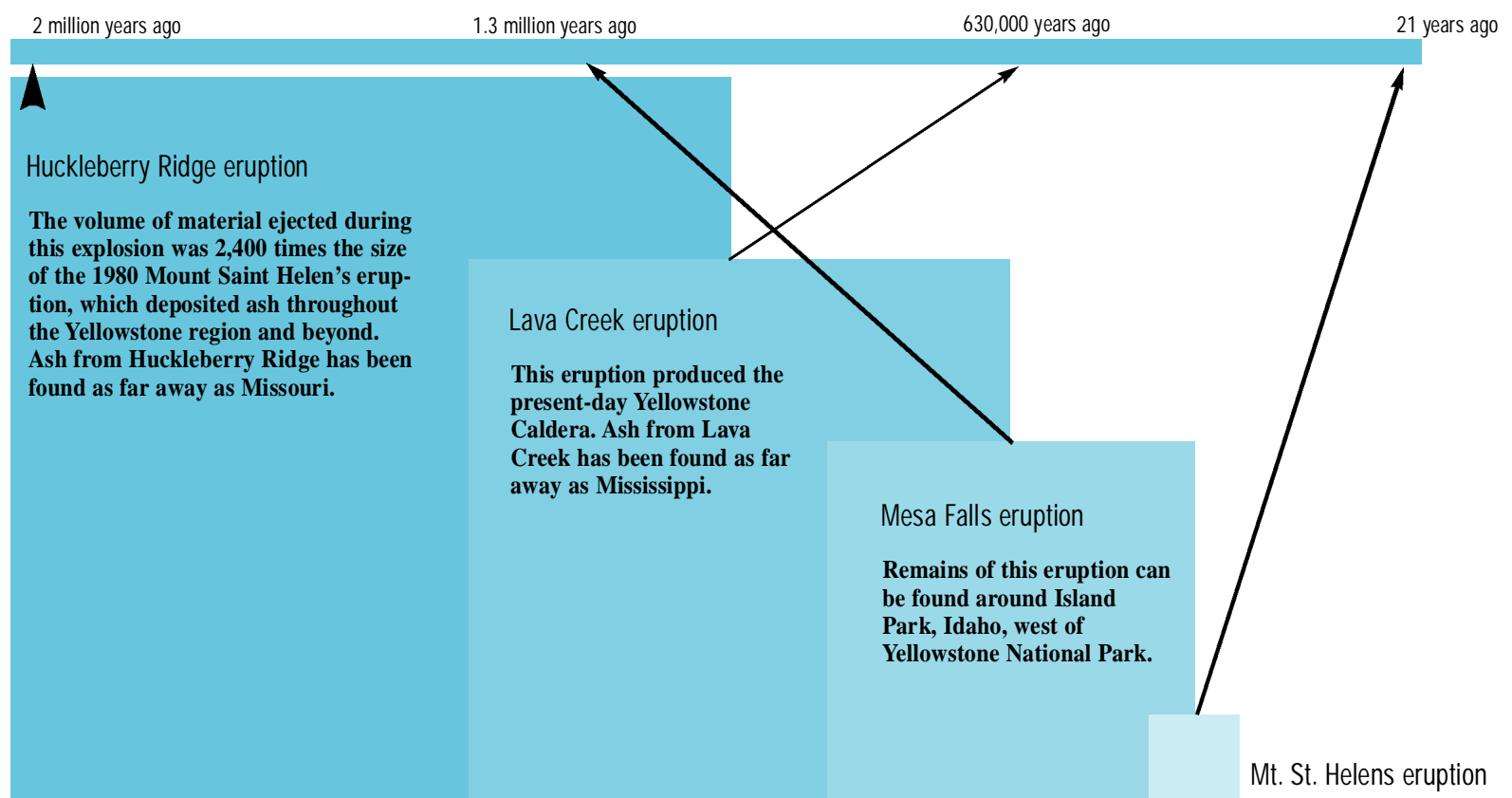
16 million years ago, volcanics begin again
in northern Nevada and southern Idaho

Yellowstone eruptions
2 million years ago to the present

The known history of volcanism in Yellowstone begins about 50 million years ago during a period of extensive mountain building throughout the northern Rocky Mountains. The Absaroka Mountains, which lie along the eastern boundary of Yellowstone, were formed during this period. These volcanoes were similar to present-day Cascade Range volcanoes such as Mt. Rainier and Mt. St. Helens. Like them, the Absaroka volcanoes were created by subduction along tectonic plate boundaries existing at that time. This volcanic activity ceased about 40 million years ago, and the region was relatively quiet. About 16 million years ago, a hotspot rose from deep within the earth and began causing a series of volcanic explosions. The hotspot remained stationary, but the tectonic plates continued moving from northeast to southwest. Geologists can trace at least nine volcanic explosions from northern Nevada through southern Idaho into Yellowstone National Park.

About 2.1 million years ago, the hotspot was under the southwestern portion of Yellowstone, extending into the Island Park area of Idaho. An eruption occurred that is estimated to have been 2,400 times the size of the 1980 Mount St. Helens explosion. A smaller eruption followed about 1.3 million years ago. Then, about 630,000 years ago, a massive eruption destroyed much of central Yellowstone, leaving a giant crater or caldera. The caldera rim is shown in the official park map and it can be seen in many areas of the park (for example, Gibbon Falls, Lewis Falls, and Lake Butte). Today the caldera is 30 x 45 miles—and it can be seen from space.

Yellowstone remains atop the hotspot and the pressure of the rising fluids and magma has created two bulges—called resurgent domes—within the caldera, one near LeHardys Rapids north of Yellowstone Lake and the other east of Old Faithful near Mallard Lake. Since the Yellowstone Caldera formed, lava has flowed onto the landscape numerous times. One explosive event occurred about 150,000 years ago creating a smaller caldera that is today filled by the West Thumb of Yellowstone Lake.



About Volcanoes

A volcano is any place where earth's crust opens and molten rock (magma) flows out and/or gases and rocks are thrown out in an eruption. In all volcanoes, magma rising from the lower part of the mantle collects in or beneath the crust. Cracks in the crust allow the magma to reach the surface; the magma is now called lava. Volcanoes that form over continental hot spots, such as here in Yellowstone, tend to have lava with lots of silica. Because silica-rich magma does not flow easily, these volcanoes tend to erupt violently.

As the heat and magma wells up, pressure builds in the volcano. At Yellowstone and some other volcanoes, earth's crust fractures and cracks in a concentric or ring-fracture pattern. At some point these cracks reach the magma, releasing the pressure, and the volcano explodes. The explosion of lava, ash, and gases is extremely hot, and the hot ash particles weld together as tuff. The huge amount of material released causes the volcano to collapse into a huge steaming crater—a caldera. Often the caldera is subsequently filled (or partially filled) with continuing lava flows.